

## CLAIMS

- 1- Aqueous suspension of one or more pigments, fillers or minerals, which may contain a dispersant polymer to stabilise the rheology of the suspension, the said pigments  
5 enabling the weight of the paper at constant surface area to be reduced, characterised by the fact that:
- a) it contains a natural carbonate and the reaction product or products of the said carbonate with gaseous  $\text{CO}_2$  and the reaction product or products of the said  
10 carbonate with one or more medium-strong to strong  $\text{H}_3\text{O}^+$  ion-providers, and  
b) it has a pH greater than 7.5 measured at  $20^\circ \text{C}$
- 2- Aqueous suspension according to Claim 1 characterised by the fact that the natural carbonate is a natural calcium carbonate and preferably a marble, a calcite, a chalk or a  
15 carbonate containing dolomite.
- 3- Aqueous suspension according to any of Claims 1 or 2 characterised by the fact that the strong  $\text{H}_3\text{O}^+$  ion-providers are chosen from hydrochloric acid or sulphuric acid or mixtures thereof and that the medium- strong  $\text{H}_3\text{O}^+$  ion-providers are chosen from  
20 among  $\text{H}_2\text{SO}_3$ ,  $\text{HSO}_4^-$ ,  $\text{H}_3\text{PO}_4$ , oxalic acid or mixtures thereof.
- 4- Aqueous suspension according to any of Claims 1 to 3 characterised by the fact that the quantity in moles of the medium-strong to strong  $\text{H}_3\text{O}^+$  ion-providers relative to the number of moles of  $\text{CaCO}_3$  is in total between 0.1 and 2, and preferably between 0.25  
25 and 1.
- 5- Aqueous suspension according to any of Claims 1 to 4 characterised by the fact that the pigment, filler or mineral has a BET specific surface area, measured in accordance with the ISO 9277 Standard, of between  $5 \text{ m}^2/\text{g}$  and  $200 \text{ m}^2/\text{g}$ , preferentially from 20  
30  $\text{m}^2/\text{g}$  to  $80 \text{ m}^2/\text{g}$  and very preferentially from  $30 \text{ m}^2/\text{g}$  to  $60 \text{ m}^2/\text{g}$ .

- 6- Aqueous suspension according to any of Claims 1 to 5 characterised by the fact that the pigment, filler or mineral presents the following characteristics:
- a mean grain diameter, measured by the sedimentation method on a Sedigraph 5100™, between 50 and 0.1 micrometers
  - and a BET specific surface area, measured in accordance with ISO 9277, ranging from 15 m<sup>2</sup>/g to 200 m<sup>2</sup>/g,
- and preferably characterised by the fact that the pigment, filler or mineral presents the following characteristics:
- a mean grain diameter, measured by the sedimentation method on a Sedigraph 5100™, between 25 and 0.5 micrometers
  - and a BET specific surface area, measured in accordance with ISO 9277, ranging from 20 m<sup>2</sup>/g to 80 m<sup>2</sup>/g
- 7- Aqueous suspension according to Claim 6 characterised by the fact that the pigment, filler or mineral presents the following characteristics:
- a mean grain diameter, measured by the sedimentation method on a Sedigraph 5100™, between 7 and 0.7 micrometers
  - and a BET specific surface area, measured in accordance with ISO 9277, ranging from 30 m<sup>2</sup>/g to 60 m<sup>2</sup>/g
- 8- Pigment, filler or mineral in the dry state characterised by the fact that it is obtained by drying an aqueous suspension according to any of Claims 1 to 7.
- 9- Process for treating pigments, fillers or minerals in aqueous suspension, containing a natural calcium carbonate allowing a reduction in the weight of the paper for a constant surface area, characterised by the fact that the said pigment is treated with a combination of one or more medium-strong to strong H<sub>3</sub>O<sup>+</sup> ion-providers and gaseous CO<sub>2</sub>.
- 10- Process for treating pigments, fillers or minerals in aqueous suspension, containing a natural calcium carbonate allowing a reduction in the weight of the paper for a

constant surface area according to Claim 9, characterised by the fact that the gaseous  $\text{CO}_2$  comes from an external  $\text{CO}_2$  supply or from the recirculation of  $\text{CO}_2$  or from the continuous addition of the same medium-strong to strong provider of  $\text{H}_3\text{O}^+$  ions as used in the treatment of from an excess pressure of  $\text{CO}_2$  preferably in the range from 0.05 to 5 bars.

- 11- Process for treating pigments, fillers or minerals in aqueous suspension, containing a natural calcium carbonate allowing a reduction in the weight of the paper for a constant surface area according to Claim 9 or 10, characterised by the fact that it comprises the following three stages:
  - a) Treatment with one or more medium-strong to strong providers of  $\text{H}_3\text{O}^+$  ions
  - b) Treatment with gaseous  $\text{CO}_2$ , whether this treatment be an integral part of stage a), be carried out in parallel with stage a) or be carried out after stage a)
  - c) The raising of the pH beyond 7.5, measured at 20° C, in a time interval after the end of stages a) and b) of between 1 hour and 10 hours and preferably between 1 hour and 5 hours without addition of a base, or immediately after the end of stages a) and b) with the addition of a base, stage c) being the final stage in the process.
- 12- Process for treating pigments, fillers or minerals in aqueous suspension containing a natural calcium carbonate allowing a reduction in the weight of the paper for a constant surface area according to Claim 11, characterised by the fact that stages a) and b) may be repeated several times.
- 13- Process for treating pigments, fillers or minerals in aqueous suspension containing a natural calcium carbonate allowing a reduction in the weight of the paper for a constant surface area according to any of Claims 9 to 12, characterised by the fact that the pH measured at 20° C is between 3 and 7.5 during stages a) and b) of the treatment and by the fact that the treatment temperature is between 5° C and 90° C, and preferably between 45° C and 60° C.

- 14- Process for treating pigments, fillers or minerals in aqueous suspension containing a natural calcium carbonate allowing a reduction in the weight of the paper for a constant surface area according to any of Claims 9 to 13, characterised by the fact that the concentration of gaseous CO<sub>2</sub> in the suspension is, in terms of volume, such that the ratio (volume of suspension : volume of gaseous CO<sub>2</sub>) is between 1:0.05 and 1:20 with the said ratio being between 1:1 and 1:20 in stage a) and between 1:0.05 and 1:1 in stage b).
- 15- Process for treating pigments, fillers or minerals in aqueous suspension containing a natural calcium carbonate allowing a reduction in the weight of the paper for a constant surface area according to Claim 14, characterised by the fact that the concentration of gaseous CO<sub>2</sub> in the suspension is, in terms of volume, such that the ratio (volume of suspension : volume of gaseous CO<sub>2</sub>) is between 1:0.05 and 1:10 with the said ratio being between 1:0.5 and 1:10 in stage a) and between 1:0.05 and 1:1 in stage b).
- 16- Process for treating pigments, fillers or minerals in aqueous suspension containing a natural calcium carbonate allowing a reduction in the weight of the paper for a constant surface area according to any of Claims 9 to 15, characterised by the fact that the duration of stage b) of the treatment is between 0 hours and 10 hours and preferably between 2 hours and 6 hours.
- 17- Process for treating pigments, fillers or minerals in aqueous suspension containing a natural calcium carbonate allowing a reduction in the weight of the paper for a constant surface area according to any of Claims 9 to 16, characterised by the fact that the pigment, filler or mineral containing natural calcium carbonate is chosen from among natural calcium carbonate or a carbonate containing a dolomite and mixtures thereof with talc and/or kaolin and or titanium oxide TiO<sub>2</sub>, magnesium oxide MgO and other minerals which are inert towards the medium-strong to strong H<sub>3</sub>O<sup>+</sup> ion-providers known in the paper field.

18- Process for treating pigments, fillers or minerals in aqueous suspension containing a natural calcium carbonate allowing a reduction in the weight of the paper for a constant surface area according to Claim 17, characterised by the fact that the natural calcium carbonate is a marble, a calcite or a chalk.

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19- Process for treating pigments, fillers or minerals in aqueous suspension containing a natural calcium carbonate allowing a reduction in the weight of the paper for a constant surface area according to any of Claims 9 to 18, characterised by the fact that the strong provider or providers of  $\text{H}_3\text{O}^+$  ions are chosen from among hydrochloric acid or sulphuric acid and that the medium-strong provider or providers of  $\text{H}_3\text{O}^+$  ions are chosen from among  $\text{H}_2\text{SO}_3$ ,  $\text{HSO}_4^-$ ,  $\text{H}_3\text{PO}_4$  and oxalic acid.

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20- Process for manufacturing the aqueous suspension characterised by the fact that after the three stages of the treatment process according to the invention, a dispersing agent and if appropriate a reconcentration stage may be used.

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21- New aqueous suspensions of several pigments, fillers or minerals containing a natural calcium carbonate allowing a reduction in the weight of the paper for a constant surface area characterised by the fact that they consist of the suspensions obtained by the process according to any of Claims 9 to 20.

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22- New aqueous suspensions of several pigments, fillers or minerals containing a natural calcium carbonate allowing a reduction in the weight of the paper for a constant surface area according to Claim 21, characterised by the fact that the pigment, filler or mineral containing a natural carbonate is chosen from among natural calcium carbonate or a carbonate containing a dolomite and mixtures thereof with talc and/or kaolin and or titanium oxide  $\text{TiO}_2$ , magnesium oxide  $\text{MgO}$  and other minerals which are inert towards the medium-strong to strong  $\text{H}_3\text{O}^+$  ion-providers known in the paper field.

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23- Pigment, filler or mineral in the dry state, characterised by the fact that it is obtained by drying an aqueous suspension according to any of Claims 21 to 22.

- 24- Preparations for use in paper-making, characterised by the fact that they contain at least one aqueous suspension according to any of Claims 1 to 7 or 21 to 22.
- 5 25- Utilisation of the aqueous suspensions according to any of Claims 1 to 7 or 21 to 22 for coating paper.
- 26- Utilisation of the aqueous suspensions according to any of Claims 1 to 7 or 21 to 22 as a paper filler.
- 10 27- Simultaneous utilisation of the aqueous suspensions according to any of Claims 1 to 7 or 21 to 22 as a paper filler and as a preparation for coating and/or pigmentation of the surface of the paper.
- 15 28- Utilisation of the aqueous suspensions according to Claim 26 characterised by the fact that the weight of the paper produced, at constant surface area, is reduced by 3% to 15%.
- 20 29- Utilisation of the aqueous suspensions according to any of Claims 1 to 7 or 21 to 22 in the field of paint.
- 30- Process for manufacturing a sheet of paper, board or similar, characterised by the fact that it includes the incorporation of a suspension or preparation according to any of Claims 1 to 7 or 21 to 22 in the process of manufacture of the sheet in terms of the preparation of the thick stock or the thin stock or both of these depending on the paper-making process, one or more times.
- 25 31- Process for manufacturing a sheet of paper, board or similar according to Claim 30, characterised by the fact that it includes the incorporation of a suspension or preparation according to any of Claims 1 to 7 or 21, 22 or 24 in the recycled white liquor or in the "coating broke", also recycled.
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- 32- Process for manufacturing a sheet of paper, board or similar according to Claims 30 or 31, characterised by the fact that the process is applied according to any of Claims 9 to 20 to the recycled white liquor or to the "coating broke".
- 5 33- Process for manufacturing a sheet of paper, board or similar according to any of Claims 30 to 32, characterised by the fact that it is applied to the manufacture of paper obtained from cellulose fibres made from wood such as deciduous or resinous woods.
- 10 34- Process for manufacturing a sheet of paper, board or similar according to any of Claims 30 to 32, characterised by the fact that it is applied to the manufacture of paper obtained from fibres not originating from wood but on the contrary synthetic fibres.
- 15 35- Paper, board or similar characterised by the fact that it is obtained according to any of Claims 30 to 34.
- 36- Paper according to Claim 35, for digital printing applications and preferably for ink jet printing.